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GENETIC VARIABILITY STUDIES IN SUMMER BRINJAL (S*OLANUM MELONGENA* L.)

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ABSTRACT

Genetic variability study was done on twenty five genotypes of brinjal at Bihar Agriculture College, Sabour during summer season of 2004-05. Variability estimates were studied for yield and morphological traits which included plant height, number of primary branches per plant, plant spread, number of eaves per plant, leaf area, number of days to 50% flowering (DAT), number of flowers per cluster, number of days to first harvest (DAT), number of fruits per plant, fruit weight , fruit length , fruit width and fruit yield per plant. The study indicated that the genotypes of brinjal in the present experiment, varied significantly with respect to all the characters under study. Highest phenotypic and genotypic co-efficient of variations were estimated for number of fruits per cluster. Heritability in broad sense was found to be highest for fruit length followed by fruit weight, number of fruits per cluster. High heritability along with genetic advance as percentage of mean were observed for the most of the characters namely number of fruits per cluster fruit yield in quintal per hectare, fruit length, fruit yield per plant, fruit weight, number of fruits per plant fruit width , number of flowers per cluster, number of primary branches per plant and number of leaves per plant . However, low genotypic and phenotypic coefficient of variations, heritability and genetic advance were noted for leaf area.

INTRODUCTION

Brinjal (*Solanum melongena* L.), is a popular vegetable crops grown in India and other parts of the world. It is an often-cross pollinated crop and belongs to the family Solanaceae. It has possibly originated in Indo-Burma region. Unripe brinjal fruit is consumed as a cooked vegetable in various ways. It is rich in nutritive value and a fairly good source of calcium, phosphorus, iron and vitamins. A number of cultivars are grown throughout the country depending upon the yield, colour, size and shape of the various cultivars. High yield and better quality are the slogans of the day. Various indigenous varieties give poor yield and are poor in terms of quality as well. It becomes essential for the breeder to identify more and more promising varieties in brinjal so that total harvest in terms of tonnage and nutrition per unit time and area can be enhanced. Success of plant breeding programme depends on the variability present in the material. The information on the nature and extent of genetic variability present in the genetic stocks, heritability and genetic advance among various traits are of considerable use in future breeding programmes. More the variability better is the chance of selection. High heritability besides high genetic gain as percent of mean gives a better picture and it aids in selection process as it directs towards contribution of additive gene in expression of any trait. Although brinjal is considered as an exploited crop but for its further improvement, the assessment of genetic variability present among the materials under study becomes imperative. Therefore keeping these facts in view, an attempt was made to study genetic variability in twenty five genotypes brinjal of diverse nature.

MATERIALS AND METHODS

The present investigation was carried out in the Farm of Department of Horticulture (Vegetables and Floriculture) at Bihar Agricultural College, Sabour (Bhagalpur) under Rajendra Agricultural University, Bihar during summer season of 2004-05. The experimental material consisted of twenty five genotypes of brinjal, selected out of the germplasm collections being maintained in the department of Horticulture (Vegetables and Floriculture) of the Bihar Agricultural College, Sabour (Table-1). The design of experiment was Randomized Block with three replications. Planting distance between the rows as well as between plants was 60 cm and recommended package of practice was followed to raise a good crop. Evaluation and characterization was performed on three randomly selected competitive plants per replication for each entry for sixteen traits viz. plant height (cm), number of primary branches per plant,

Table-1 : List of Brinjal genotypes included in the experiment.

Sl. No.	Genotypes	Source
1.	ABL-1	Gujarat Agril. Univ., Anand Cam pus
2.	ABR-1	Gujarat Agril. U niv., Anand Cam pus
3.	ABR-2	Gujarat Agril. Univ., Anand Campus
4.	A runa	P.D.K.V., Akola
5.	BB-40	O.U.A.T., Bhubaneshwar
6.	BB-46	O.U.A.T., Bhubaneshwar
7.	BB-60-C	O.U.A.T., Bhubaneshwar
8.	BB-71	O.U.A.T., Bhubaneshwar
9.	CHBR-1	H.A.R.P., Ranchi
10.	DBL-1 1	I.A.R.1., New Delhi
11.	JNDBL-1	Gujarat Agril. U niv., Junagadh Cam pus
12.	KS-224	C.S.A.U.A.T., Kalyanpur
13.	KS-227	C.S.A.U.A.T., Kalyanpur
14.	KS-331	C.S.A.U.A.T., Kalyanpur
15.	KS-352	C.S.A.U.A.T., Kalyanpur
16.	Mu ktakesh i	B.A.C., Sabou r
17.	N DB-18	N.D.Univ. of Agril. & Tech., Faizabad
18.	NDB-26-1	N.D.Univ. of Agril. & Tech., Faizabad
19.	N DB-28-2	N.D.Univ. of Agril. & Tech., Faizabad
20.	Pusa Kranti	I.A.R.I., New Delhi
21.	Pusa Purple Long	1.A.R.I., New Del hi
22.	Punjab Sadabahar	P.A.U., Ludh iana
23.	Rajendra Anna purna	B.A.C., Sabour
24.	Rajend ra Baigan-11	B.A.C., Sabour
25.	71-19	B.A.C., Sabour

Table-2 : Mean sum of squares for genotype, replication and error of twenty two traits in twenty two different brinjal genotypes.

Characters	Mean sum of square		
	Replication	Genotype	Error
	df=2	df=24	df=48
Plant height (cm)	21.035	108.9276**	10.0191
No. of primary branches/plant	0.0625	2.6829**	0.0975
Plant spread (m^2)	0.0006	0.0029**	0.0006
No. of leaves/plant	54.7217	620.0383**	58.1904
Leaf area (cm^2)	42.1437	80.6881 *	40.0645
No. of days to 50% flowering (DAT)	9.3104	43.94**	8.2714
Number of flowers per cluster	0.093	0.8042**	0.0375
Number of fruits per cluster	0.0098	0.6301**	0.0072
Fruit setting (%)	1.7706	45.351**	1.7989
No. of days to first harvest (DAT)	37.2245	54.2118**	16.9534
Number of fruits per plant	0.0394	14.9005**	0.3726
Fruit weight (g)	21.8716	1961.5892**	21.1074
Fruit length (cm)	0.2459	35.7765**	0.2775
Fruit width (cm)	0.2209	3.3749**	0.0791
trightFruit yield/ plant (kg)	0.0042	0.1021**	0.0011
Fruit yield (q/ha).	281.7	8116.03**	116.634

Highly significant (**) at P = 0.01

Table-3 : Estimates of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) and heritability, genetic advance and genetic gain as percent of mean.

Characters	GCV	PCV	Heritability	G.A	Mean	GA as % of Mean
Plant height (cm)	11.37	12.98	76.69	10.36	50.51	20.51
No. of primary branches/plant	17.36	18.31	89.84	1.81	5.35	33.89
Plant spread (m^2)	8.08	10.55	58.59	0.04	0.35	12.73
No. of leaves/plant	13.69	15.68	76.29	24.62	99.93	24.64
Leaf area (cm^2)	4.01	7.99	25.26	3.81	91.66	4.16
No. of days to 50% flowering (DAT) ((DAT) DAT)	7.27	9.47	58.97	5.45	47.41	11.5
Number of flowers per cluster	18.17	19.46	87.19	0.97	2.78	34.95
Number of fruits per cluster	34.11	34.69	96.65	0.92	1.34	69.07
Fruit setting (%)	10.35	20.08	88.97	7.4	36.81	20.1
No. of days to first harvest (DAT)	5.03	7.73	42.28	4.72	70.09	6.73
Number of fruits per plant	27.4	28.44	92.86	4.37	8.03	54.39
Fruit weight (g)	28.44	28.9	96.84	51.56	89.42	57.66
Fruit length (cm)	29.81	30.16	97.71	7	11.54	60.7
Fruit width (cm)	23.31	24.13	93.28	2.09	4.5	46.37
Fruit yield/ plant (kg)	29.27	29.78	96.58	0.37	0.63	59.25
Fruit yield (q/ha)	30.93	31.6	95.81	104.12	166.96	62.36

plant spread (m^2), number of leaves per plant, leaf area (cm^2) number of days to 50% flowering (DAT), number of flowers per cluster, number of fruits per cluster, fruit setting (%), number of days to first harvest (DAT), number of fruits per plant, fruit weight (g), fruit length (cm), fruit width (cm), fruit yield per plant (Kg) and fruit yield (q/ha). The data were analyzed according to the model as given by Panse and Sukhatme (1967) for randomized block design experiments using the mean values in each replication for all the genotypes. Genotypic and phenotypic coefficient of variation was calculated using the formulae given by Burton (1952). Broad sense heritability was calculated as per Lush (1949) and genetic advance was estimated by the method suggested by Johnson *et al.* (1955).

RESULTS AND DISCUSSION

Analysis of variance revealed that the genotypes of brinjal in the present experiment, varied significantly with respect to all the characters under study (Table-2). This could be due to considerable range of variability with respect to almost all the characters under study. Perusal of the Table -3 revealed that the highest phenotypic and genotypic co- efficient of variations were estimated for number of fruits per cluster (34.69% and 34.11%), indicating the widest range of variability. The characters namely number of fruits per cluster (34.69% and 34.11%), number of fruits per plant (28.44% and 27.4%), fruit weight (28.9% and 28.44%), fruit length (30.16% and 29.81%), fruit yield per plant (29.78% and 29.27%) and fruit yield in quintal per hectare (31.6%and 30.93%) had high phenotypic and genotypic coefficients of variation, suggesting large genetic variability and hence provides ample scope for effective improvement in these characters. This is in consonance with the findings of Sharma and Swaroop (2000) and Mohanty (2001) in brinjal.

Genotypic coefficient of variation gives an idea of the quantum of genetic variability in a character and provides a means to com pare the genetic variability in the different quantitative characters. But, it is not possible to estimate heritable variation with the help of genetic co-efficient of variation alone. According to Burton (1952), the genetic coefficient of variation together with heritability estimate, give a better picture of the amount of advance to be expected by selection. Heritability in broad sense provides useful biometrical concept and has been considered to be an index of effectiveness of selection because it helps in proportioning the total variation into hereditary and environmental effects.

Heritability in broad sense was found to be highest for fruit length (97.71%) followed by fruit weight (96.84%), number of fruits per cluster (96.65%). The lowest estimates of heritability were noted for leaf area in all the four environments followed by number of days to first harvest. Other characters namely, number of primary branches per plant, number of flowers per cluster, fruit set, number of fruits per plant, fruit width, fruit yield per plant and fruit yield (q/ha) exhibited more than 80 per cent heritability. Similar findings has also been reported by Singh and Singh (1981), Dhankhar and Singh (1983) and Singh and Singh (1996) in

brinjal. High heritability estimates for most of the quantitative characters in the present investigation indicated that these quantitative characters could be improved to a great extent, through selection on the basis of phenotypic performance of different genotypes since they are less affected by environment although non-additive gene action on heritability in broad sense cannot be ruled out. High heritability indicates the effectiveness of selection based on good phenotypic performance but does not necessarily mean a high genetic gain for particular traits. Johnson *et al.* (1955) suggested that high heritability supplemented with high genetic advance as percentage of mean were more useful than heritability alone. In the present investigation, high heritability (more than 80.00 %) along with genetic advance as percentage of mean (more than 20 %) were observed for the most of the characters namely number of fruits per cluster (69.07%), fruit yield in quintal per hectare (62.36%), fruit length (60.7%), fruit yield per plant (59.25%), fruit weight (57.66%), number of fruits per plant (54.39%), fruit width (46.37%), number of flowers per cluster (34.95), number of primary branches per plant (33.89%) and number of leaves per plant (24.64%). It suggests that genotypic variance for these characters were probably due to additive gene effects (Panse, 1957). Therefore, the selection based on phenotypic performance of these characters would be useful for achieving desired as mentioned earlier. The characters like plant height, plant spread, and number of days to 50% flowering had high heritability and low genetic advance in all the environments indicated large amount of non-additive genetic variance and are less effective to selection. Leaf area and number of days to first harvest exhibited low heritability along with low genetic advance as per cent of mean indicated presence of non-additive gene effects. The results are in consonance with the findings of Chaudhary and Pathania (1999), Rai *et al.* (1999) Negi *et al.* (2000) and Prasad *et al.* (2004) in brinjal.

CONCLUSION

All the twenty five genotypes of brinjal varied significantly with respect to sixteen different characters under study. High variability was observed for all growth as well as yield characters. Based on genetic variability study, it may be concluded that the characters like fruit weight, fruit length, number of fruits per cluster and number of fruits per plant recorded high genotypic and phenotypic coefficient of variations along with along with high heritability and genetic advance. This implies that there is a greater scope for improving these characters by simple phenotypic selection. On the contrary, low genotypic and phenotypic coefficient of variations, heritability and genetic advance were noted for leaf area, implicating presence of non-additive gene effects, suggesting heterosis breeding a better option for improvement of this trait.

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